Site Seeing
Beginning Level

Site Seeing Learning Activities

These pre-protocol activities introduce students to the concept of a system. The students will explore different scales of the system, identify the components, and try to determine their relationship to each other. The concept of a system will help students understand why they are conducting biometry measurements.

Purpose

To help students determine that a system's boundaries are based upon the question(s) a scientist wants to answer

Overview

Students will investigate the center pixel of a homogeneous 90 m x 90 m Land Cover Sample Site. The students will use simple observational techniques. The intention is for students to become familiar with their system.

Student Outcomes

Science Content

Physical Science

- Objects have observable physical properties.
- People can often learn about things around them by just observing.
- Describing things as accurately as possible is important.

Life Science

- Each plant has different structures but some plants are alike in the way they look.
- Plants have features that help them live in different environments.

Science and Technology

- People have always had questions about their world. Science is one way of answering questions.
- Scientists in different disciplines ask different questions, use different methods of investigation.

Science as Inquiry

- Scientists conduct investigations for a variety of reasons.

Geography

Primary

- The physical characteristics of places

Middle

- Physical characteristics of places
- The distribution of major physical features at different scales

Enrichment

- A homogeneous 90 m x 90 m Land Cover Sample Site can be considered a system.
- Your system includes components such as plants, water, soil, rocks, and animals.
- Your system has inputs such as solar energy, water, carbon dioxide, oxygen, and dust.
- Your system has outputs such as water, carbon dioxide, oxygen, heat, and waste products.

Scientific Inquiry Abilities

- Draw pictures that correctly portray at least some of the features of the thing being described.
- Propose answers to questions about the system described.

Level

Primary

Time

Two or three class periods

Materials and Tools

- Paper (regular size and cut to specific sizes, see *Preparation*)
- Colored pencils or crayons
- Compasses
- Camera

String (pre-measured)
Ruler and/or Tape measure
Containers to hold soil samples

Preparation

Cut two different sizes of paper for each student – one approximately 11 cm x 11 cm and one 5 cm x 5 cm.

The center pixel of a natural homogeneous Land Cover Sample Site should be laid out.

Prerequisites

Students should know how to use a compass and how to pace (See *Investigation Instruments*).

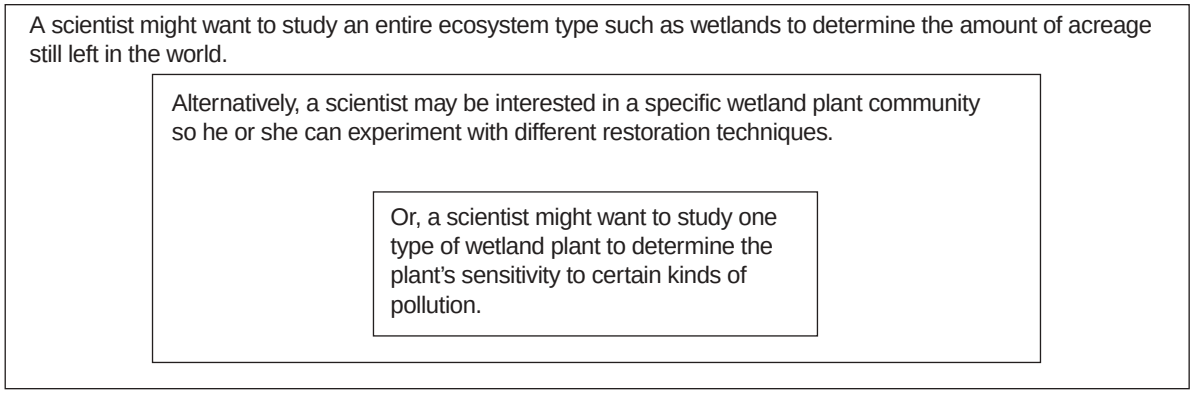
Introduction to Systems and Scale

A *system* is any collection of interacting "things" that have some influence on one another and appear to operate as a unified whole. The "things" can be almost anything, including objects, organisms, machines, ideas, numbers, or organizations. Scientists investigate natural systems for a variety of reasons. The question a scientist wants to answer often determines how the boundaries of the system are defined. See Figure LAND-SB-1. The example below depicts the relative scale a scientist might want to use to answer different questions. These studies would consider completely different factors determined by the system's scale.

When we repeat biometry measurements every year in the same Land Cover Sample Site, we are looking at a certain system to see if we can detect changes over time. These may include the growth of trees and changes in the amount of canopy and ground cover. By collecting data over many years, we can see if the data are consistent over time or if there is variation. To understand the data, students need to be familiar with the variety of factors affecting a system. If they know what is coming in and out of the system and the basic relationships of the components within the system, they will be able to see patterns that will help them make generalizations and predictions. For example, water comes into a forested system in the form of rain. Some of the water is stored in the trees and is used in growth. Some is released into the atmosphere. Some stays on the surface. Some percolates into the ground and replenishes the water table.

Data variation could indicate changes in either the input, output, or the cycles that process matter and energy. In a series of drought years, the growth of the trees may be stunted due to the lack of water, stress, production, or fitness. Consistent temperature rises could cause a longer growing season resulting in an increase in production. This may be evident in leaves being on the trees longer or the trees increasing in size more during those years, as

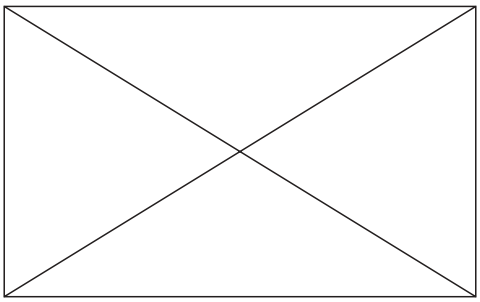
Figure LAND-SB-1: Using Questions to Determine System Boundaries



seen in the circumference or tree height. The data your class collects will help your students and the GLOBE scientists understand the system around them.

What To Do and How To Do It

1. Have students close their eyes and imagine their perfect place in the whole world (e.g. beach forest, next to a campfire, in a candy store). Give them a minute to imagine this image. Have them draw their special place on a piece of paper. How many of the students imagined a natural area for their special place?
2. On the other side of the piece of paper, have students draw two diagonals that intersect in the center. This should form four triangles. This paper will be used in Step 4.



3. Visit the center pixel of a 90 m x 90 m natural Land Cover Sample Site. Ask the students to answer the following questions.
   a. What do you see, smell, feel, and hear?
   b. Is it wet/dry, warm/cool?
   c. Is there a lot of sunlight hitting the ground?
   d. What living things do you see? Can you name some?
   e. What non-living things do you see? Are they natural or man-made?
   f. How might your system change in the different seasons?
4. Staying in the center pixel of the site, ask the students to draw each boundary on the divided paper – one triangle for each boundary/view – North, South, East, and West. These will be side views. Encourage them to be observant and draw details.
5. From the center point, take a picture of each directional view. (Be sure to record the exposure number.) Once the pictures are developed, have the students compare their sketched views with the photographs. Have they drawn enough detail in their sketches to identify which picture corresponds with each compass direction? Are there parts of the system that they missed?
6. In order to obtain an increased knowledge of the natural Land Cover Sample Site, have students lay out on the ground a 30 m x 30 m square made of string. Have them draw what they observe on the 11 cm x 11 cm piece of paper.
7. Have them answer questions a through f from Step 3. How did changing the boundaries change what they saw?
8. Have the students take a soil sample from their individual plots with an auger, trowel, or shovel. Try to get at least 15 cm down into the soil and place it in the soil container.
9. In the classroom, have the students observe the soil. Have the students draw what they see on the 5 cm x 5 cm piece of paper. Now what parts do you see? Are there living things here or parts of living things?
10. On a flat surface, ask the students to put the largest piece of paper down first (Land Cover Sample Site Sketch), place the medium-sized paper on top (30 m x 30 m square sketch) and the smallest piece of paper (soil sketch) on top of that. Ask students the following questions:
    a. What questions could you answer better when you looked at the 30 m x 30 m square (or system)?
    b. What questions could you answer better when you looked at the soil sample rather than the entire Land Cover Sample Site?
    c. How did changing the boundaries

change what you observe?

Discussion Questions

1. If something happens in your neighbor's 30 m x 30 m square, how do you think it affects your square?
2. What is above your 30 m x 30 m square? What is below it?
3. Does what is above and below affect your square in any way? How?
4. What enters and leaves your system? (sunlight, water, seeds, nuts, animals, etc.)